

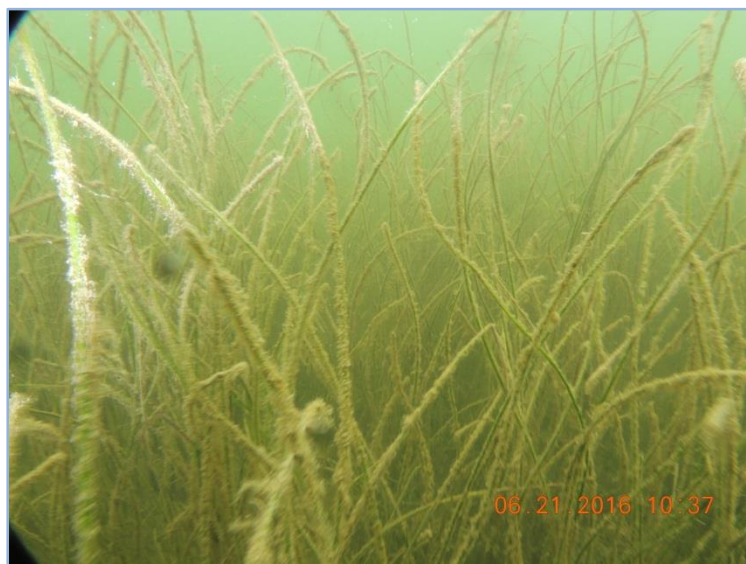
**Julia Tuttle Basin Seagrass
June 2017 Update
Miami-Dade RER-DERM**

Seagrass loss event in North Biscayne Bay

Julia Tuttle Basin



Julia Tuttle Basin Seagrass



- The basin seagrass community was predominantly characterized by high biomass high density *Syringodium*.
- Photos taken during 2016 surveys near fixed transect which appeared stable.

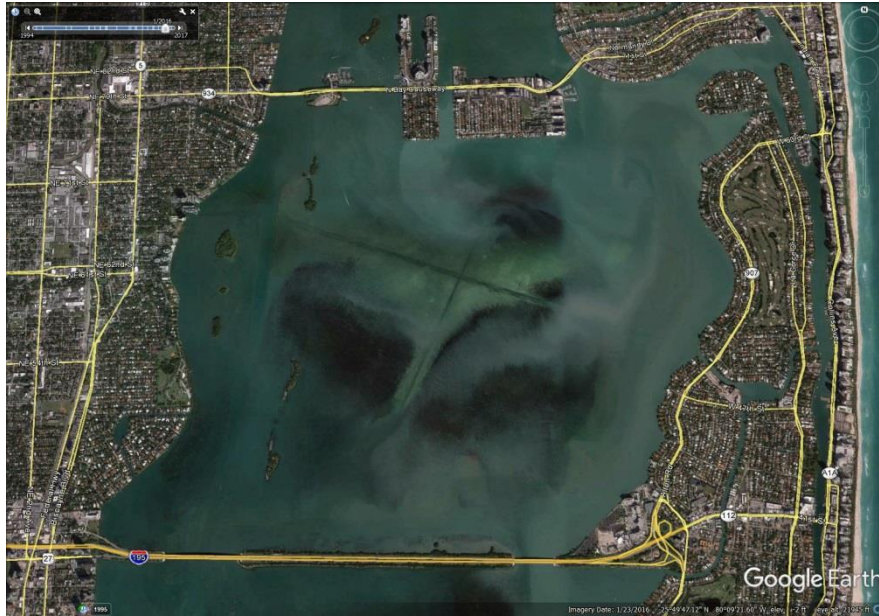


Julia Tuttle Basin Time Series images

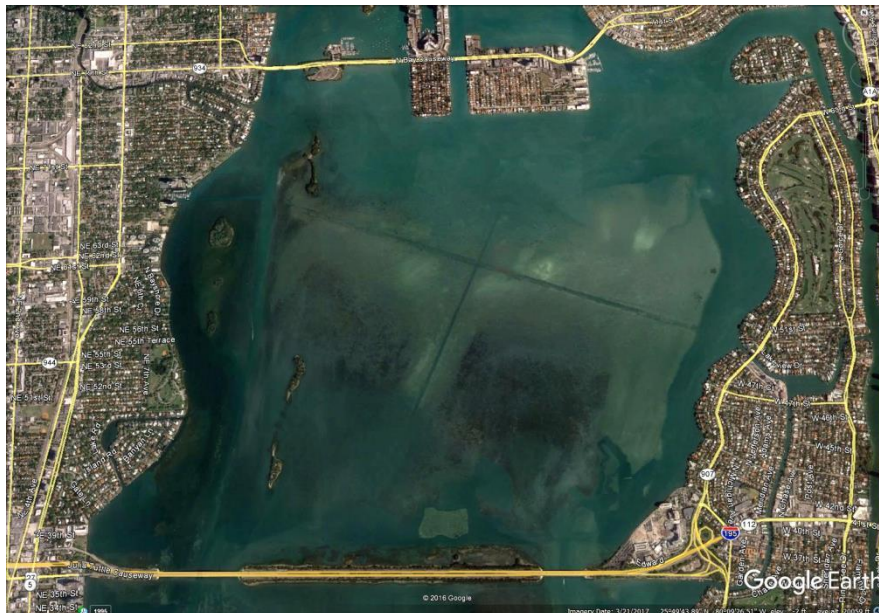


- Losses appear evident in 2013 Google Earth images.
- North to South and progressing along remnant channels.

Julia Tuttle Basin Recent Images

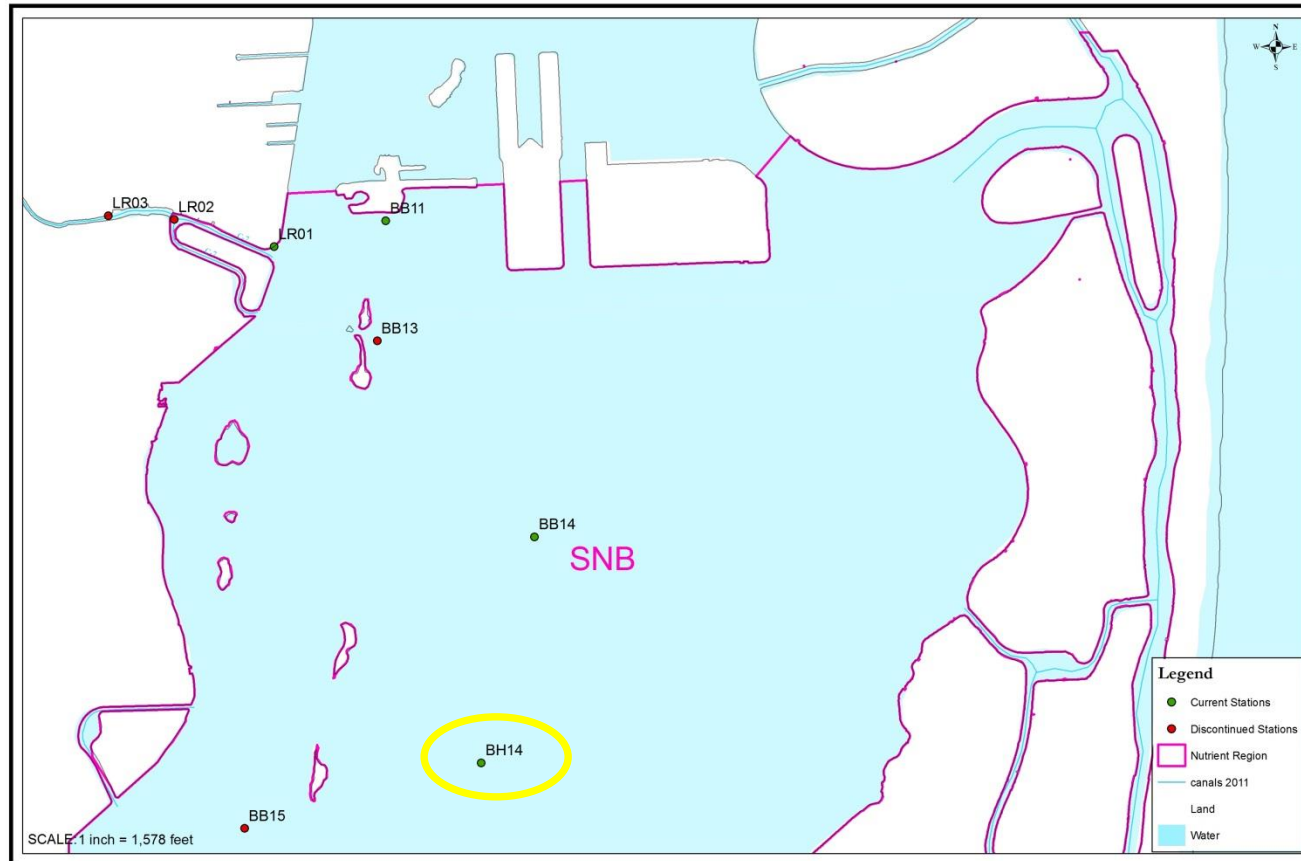


- **2016 Google Earth Imagery.**



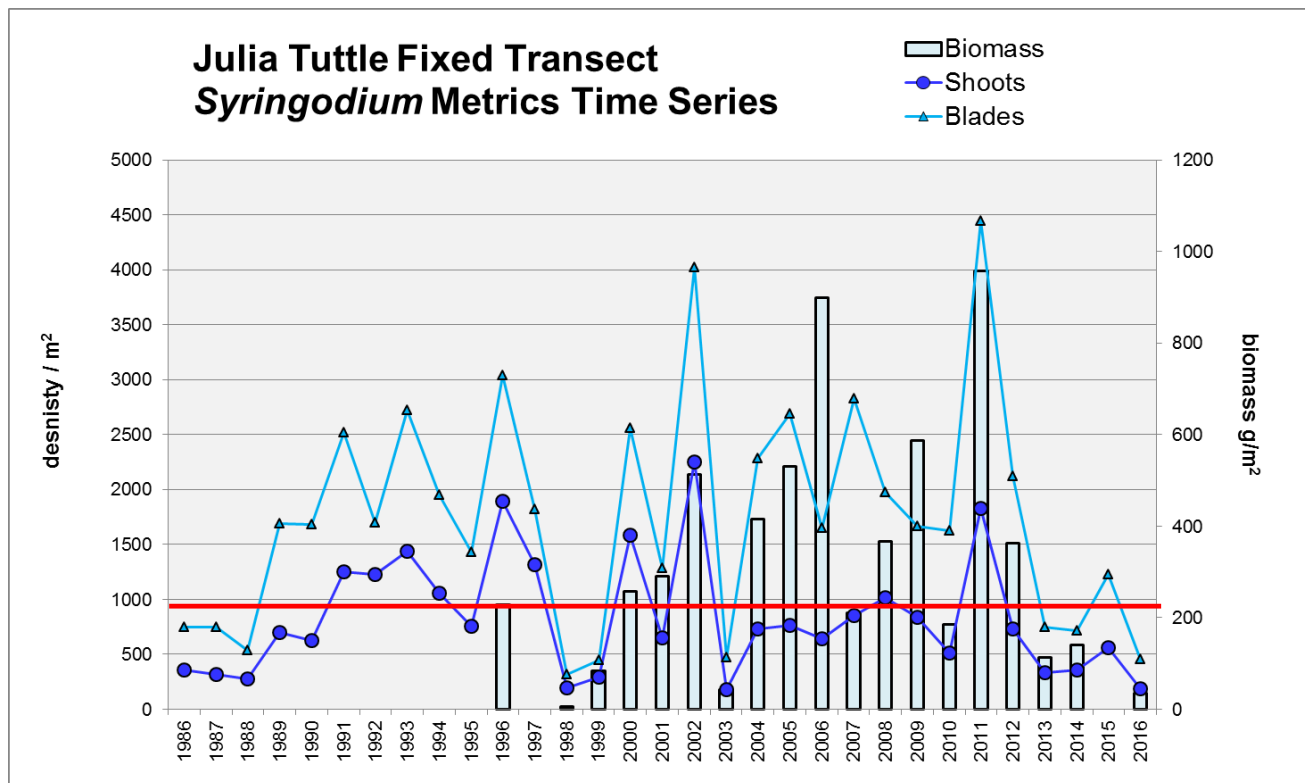
- **2017 Google Earth Imagery.**

Julia Tuttle Basin Benthic Monitoring



- Longterm benthic habitat monitoring transect.
- Initiated in 1986.
- 150ft long with three fixed quadrats.
- BBCA, shoot and blade density, standing crop biomass.

Julia Tuttle Basin Longterm Seagrass Monitoring



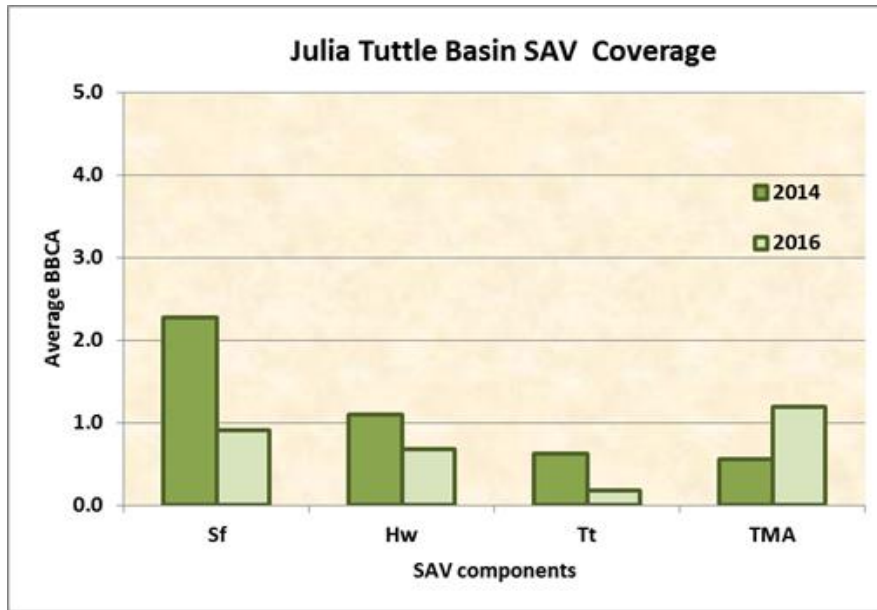
- **Extraordinary density and biomass.**
- **Other stations with *Syringodium* typically range <800 shts/m² and standing crop biomass <200 g/m².**
- **Reduced density beginning in 2013 may have been an indicator of change in the basin.**

2014 Estimates of Seagrass Losses

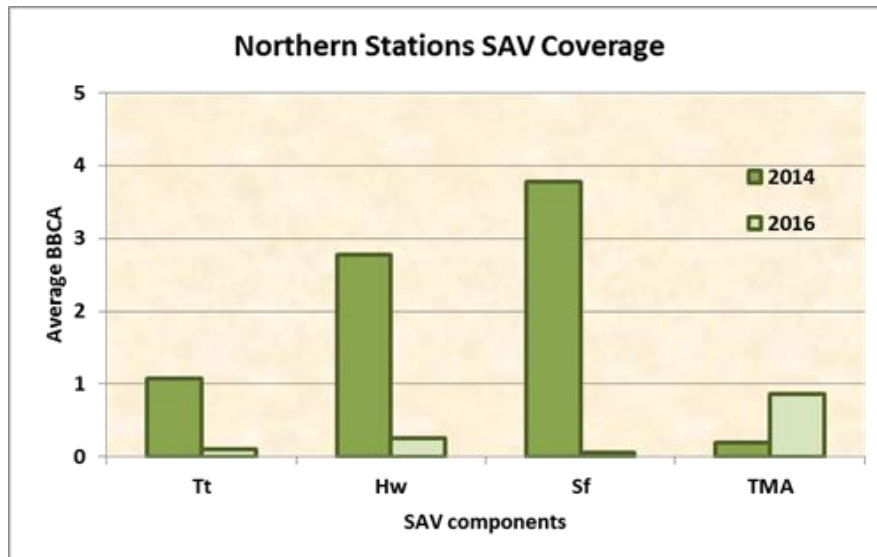


- Contour projections of available USGS data showed the extent of the seagrass bed in 2014.
- A subset was resurveyed by DERM in 2016.
- Monitoring using these data is continuing.

2016 Estimates of Seagrass Losses

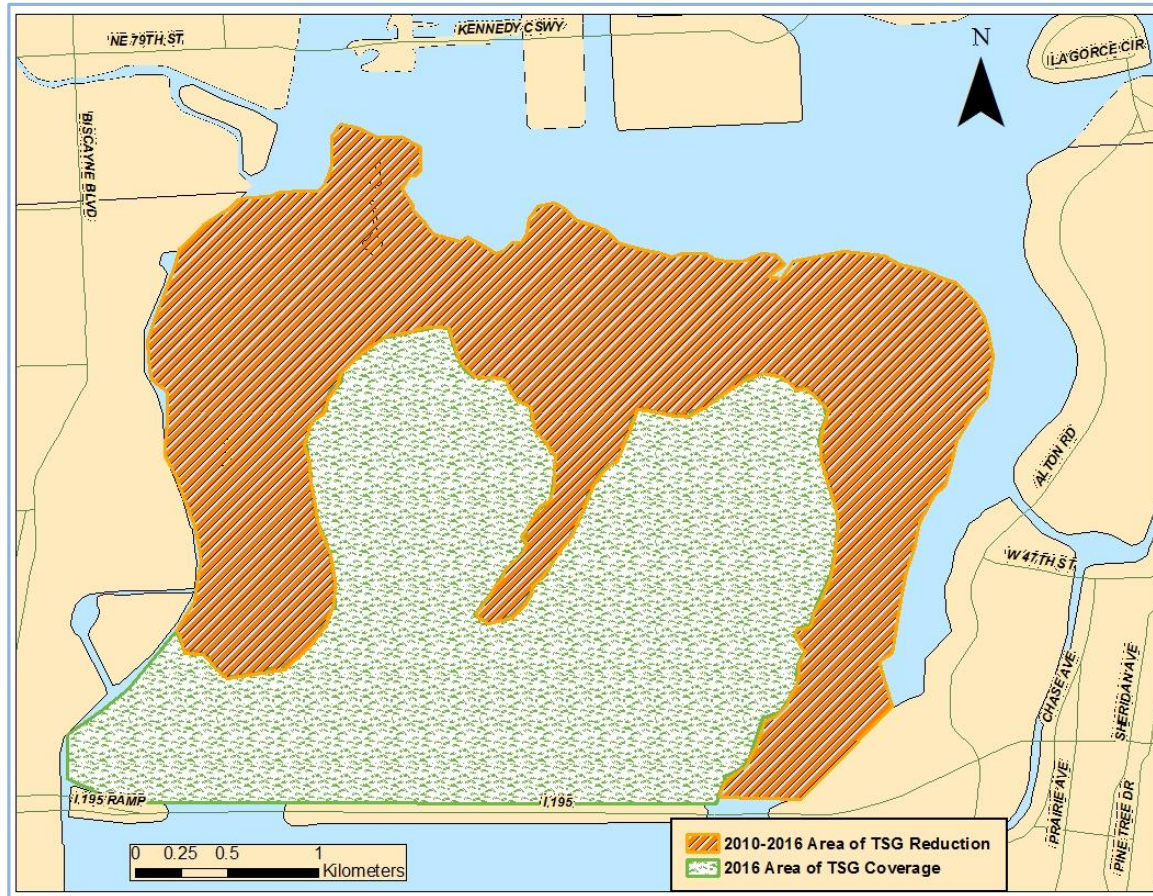


- Coverage was reduced throughout the basin.



- Dramatic reductions were documented in the northern sampling area.

2016 Estimates of Seagrass Losses

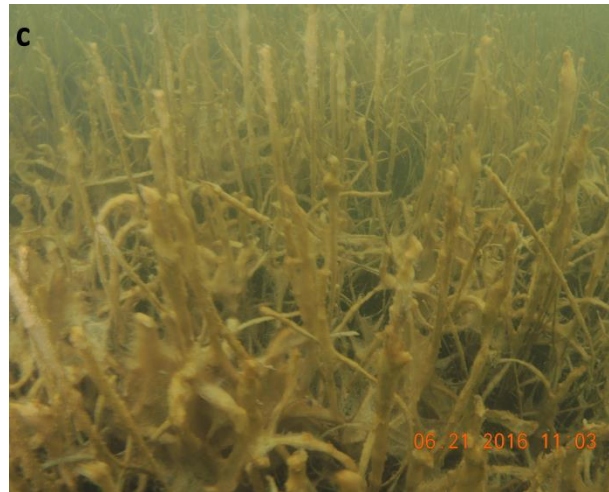


- Based on Google Earth imagery, by 2016 it was estimated that 45% loss of seagrass area.
- Indications are that the losses continued and this needs to be updated for 2017.

Before event	Present	Lost Area	Percent Decrease
12.0 Km ² (2002-2008)	6.6 Km ² (2016)	5.4 Km ²	45.00%



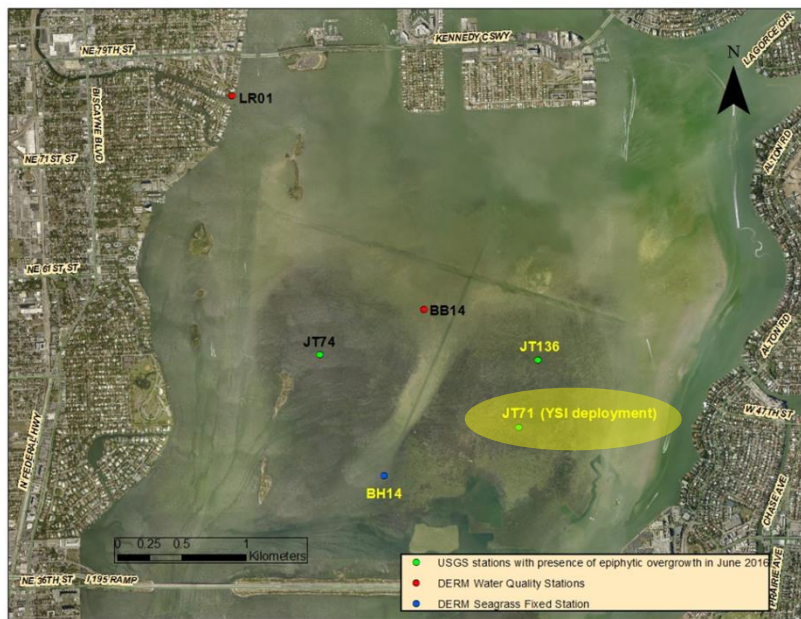
2016 Seagrass Surveys



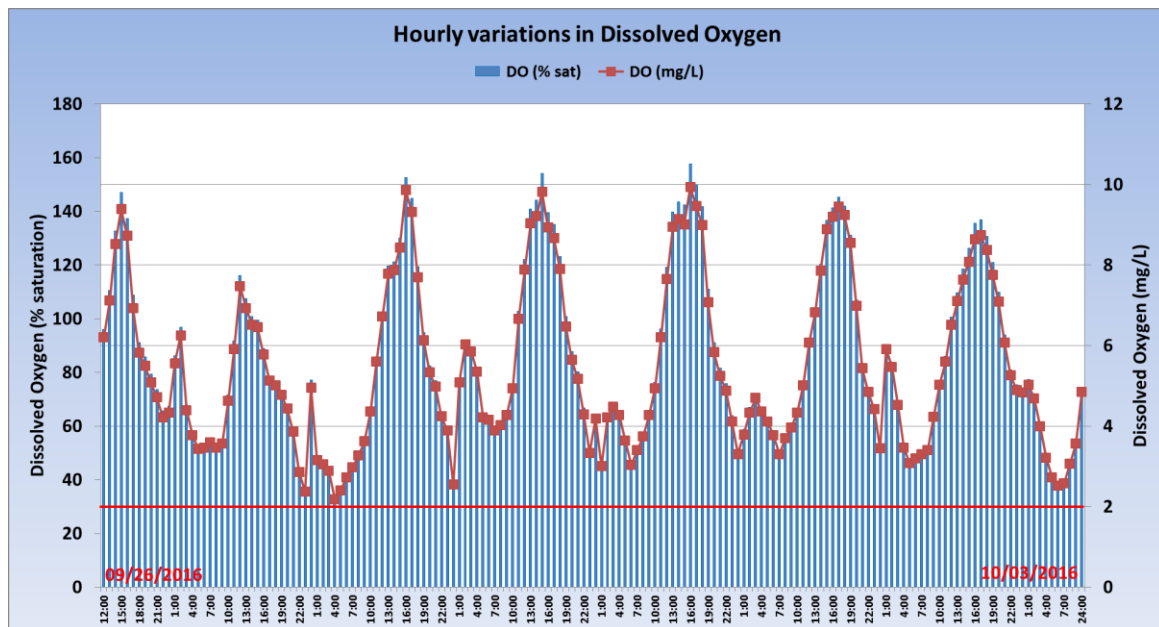
- Filamentous epiphytes identified as *Beggiatoa* – which are generally found as white filamentous mats on top of sulfide-rich sediments.
- Indicative of low Dissolved Oxygen. However all grab samples and deployed continuous monitoring did not reveal measurements <2.0mg/l.

Photos taken during 2016 surveys which contrast with the southern part of the basin.

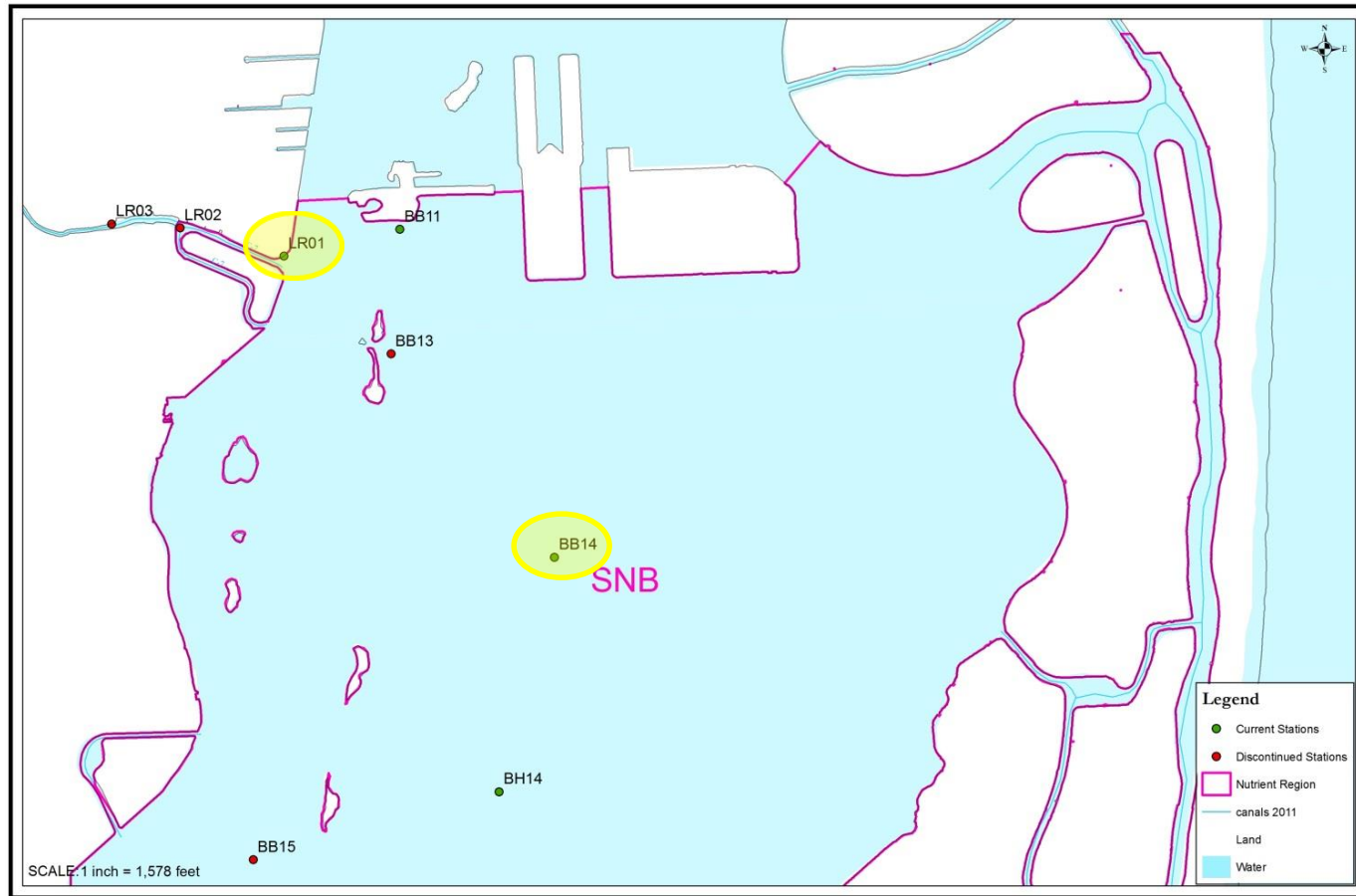
2016 Continuous Dissolved Oxygen Measurements



- Deployed instrument in area with observed cyanobacteria-epiphytic overgrowth. Although dissipated compared to earlier observations.
- Dates 9/26/16-10/08/16.
- No measurements $< 2.0 \text{ mg/L}$.

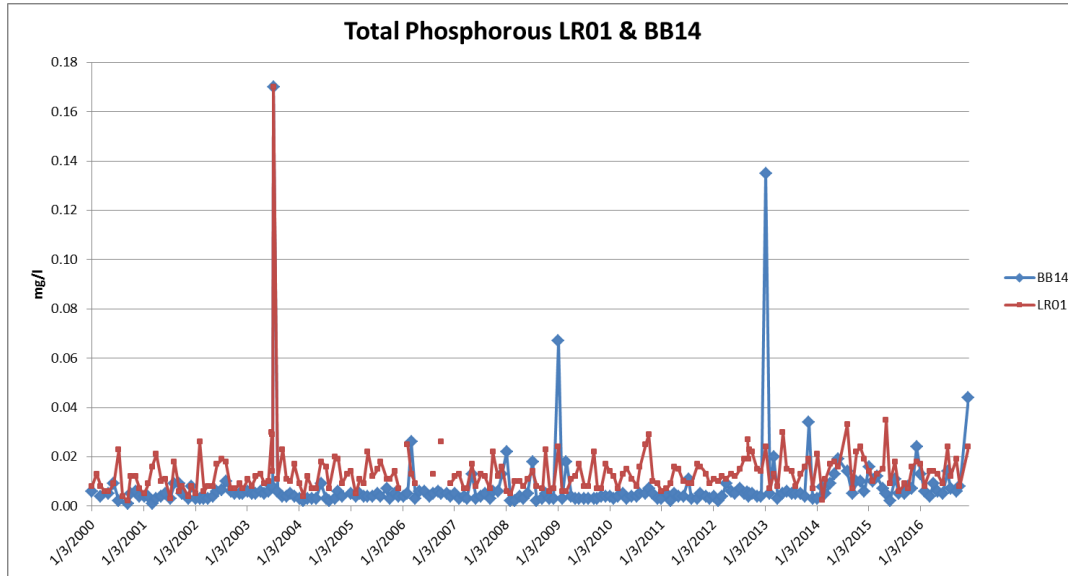


Julia Tuttle Basin Water Quality Monitoring

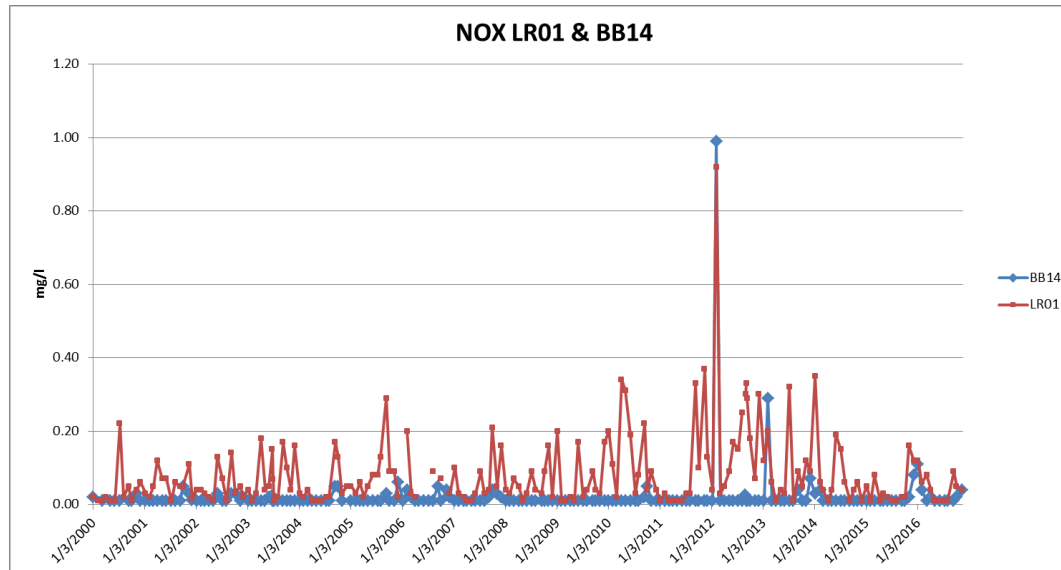


- In the South North Bay Nutrient Region.
- Relying primarily on LR01 and BB14

Julia Tuttle Basin Annual Mean Nutrients 1980-2016

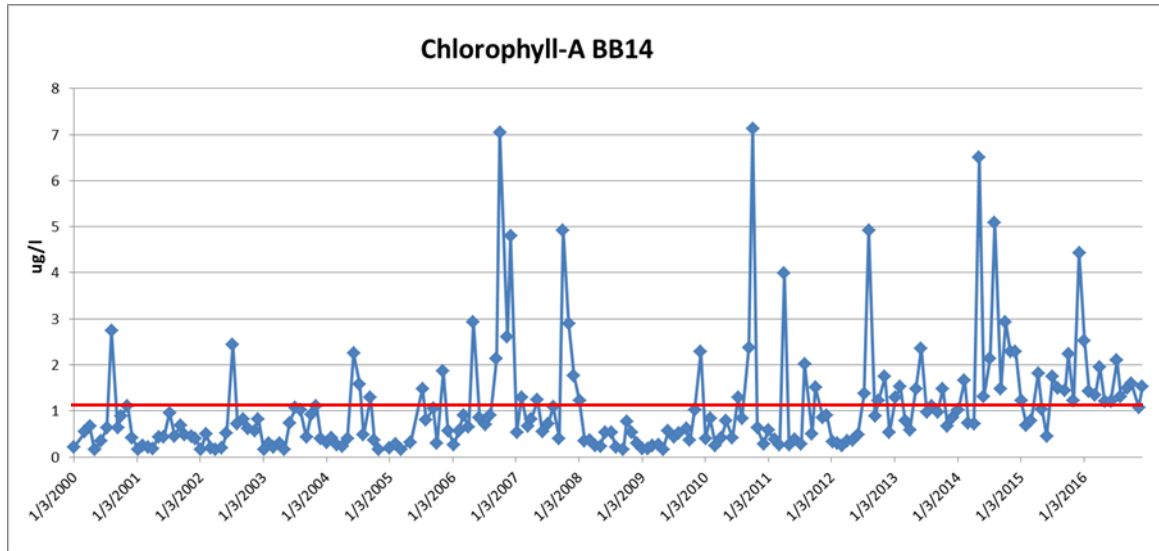


- A number of elevated Phosphorus measurements appear independent of the Little River canal.
- Driver of the loss or response???

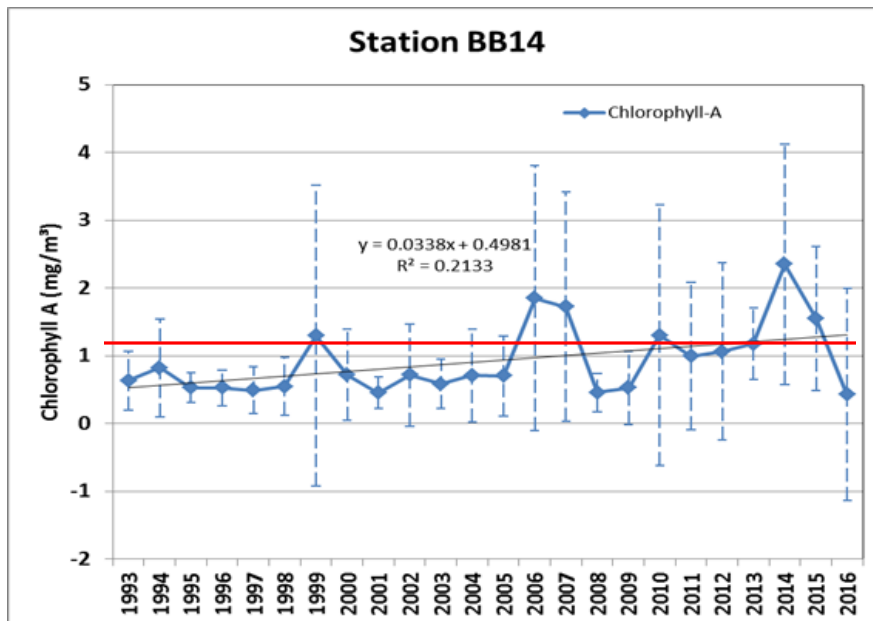


- Nitrate/Nitrite elevated measurements 2012-2013.

Julia Tuttle Basin Chlorophyll-A



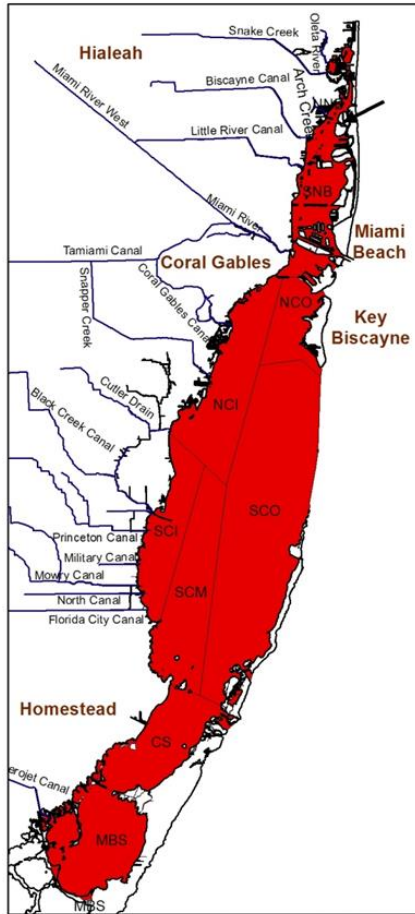
- SNB region criteria
1.1ug/l
- Increased frequency
above 1.0 ug/l since June
2012



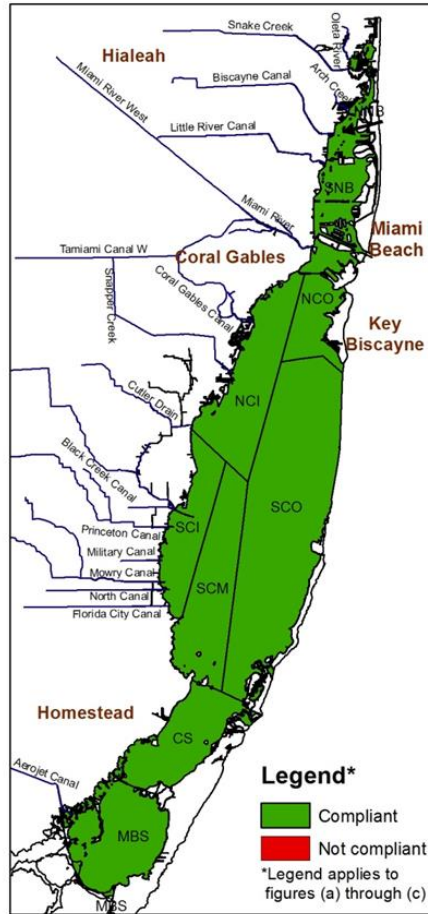
- Long term annual mean shows
Chlorophyll-A increasing trend
since 1993.
- Not necessarily a driver in the
loss, rather this could be a result
nutrients associated with
seagrass decomposition.

Numeric Nutrient Assessment for Regions of Biscayne Bay 2016

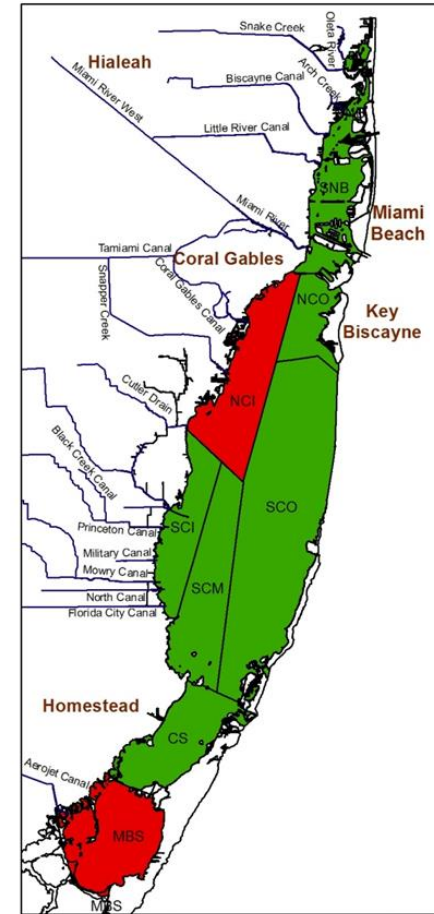
(a) Chlorophyll a



(b) Total Phosphorus



(c) Total Nitrogen

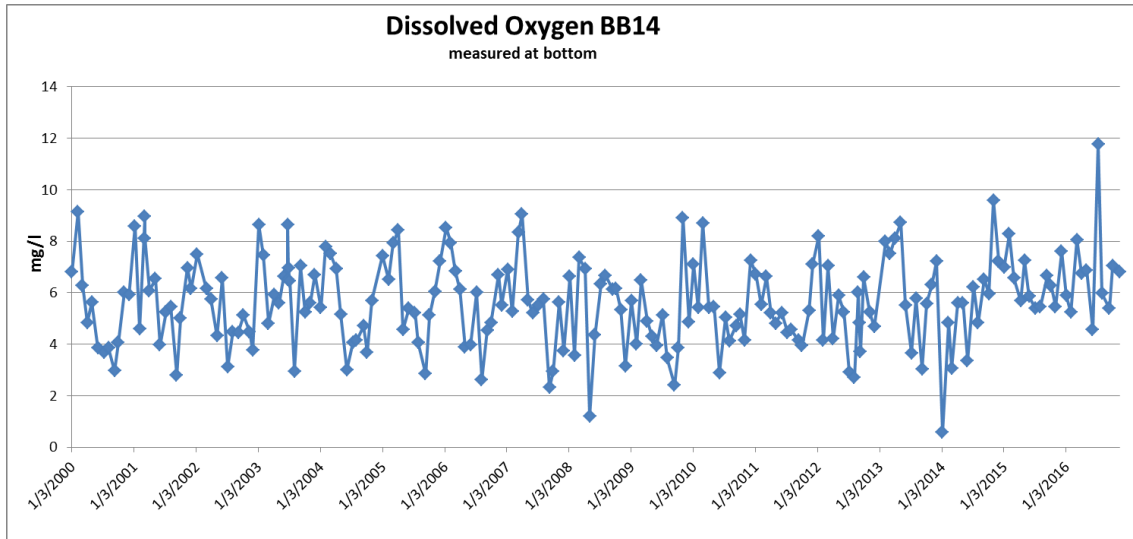


Compliance= Annual Geometric Mean (AGM) does not exceeds criteria more than once in a consecutive three (3) year period.

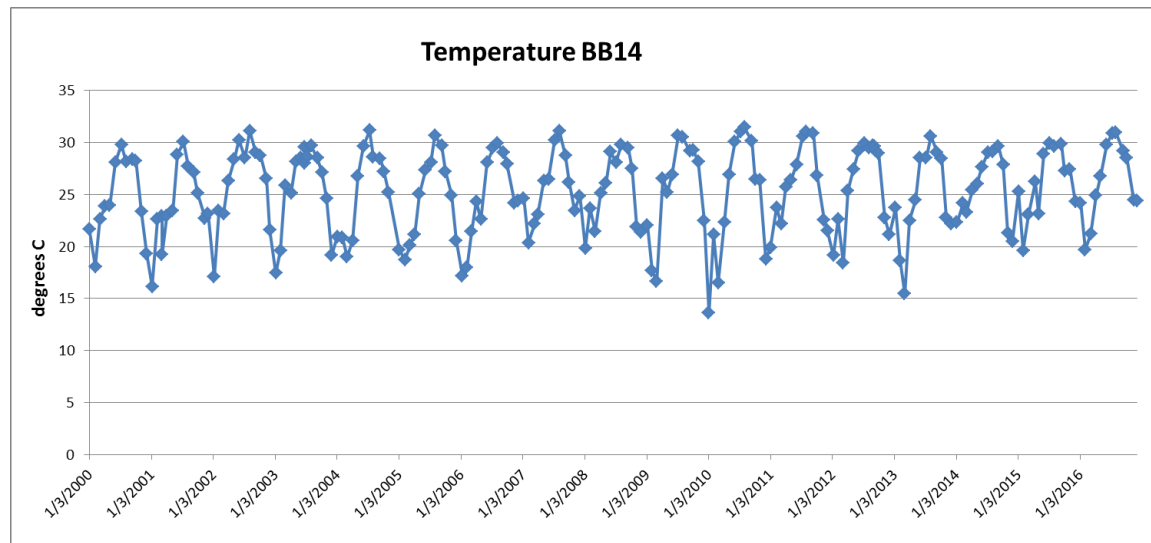
Chlorophyll-A Annual Geometric Mean Nutrient Region Criteria

- SNB Criteria 1.1 ug/l
- 2014 1.34 ug/l
- 2015 1.26 ug/l
- 2016 1.21 ug/l

Julia Tuttle Basin Physical Parameters

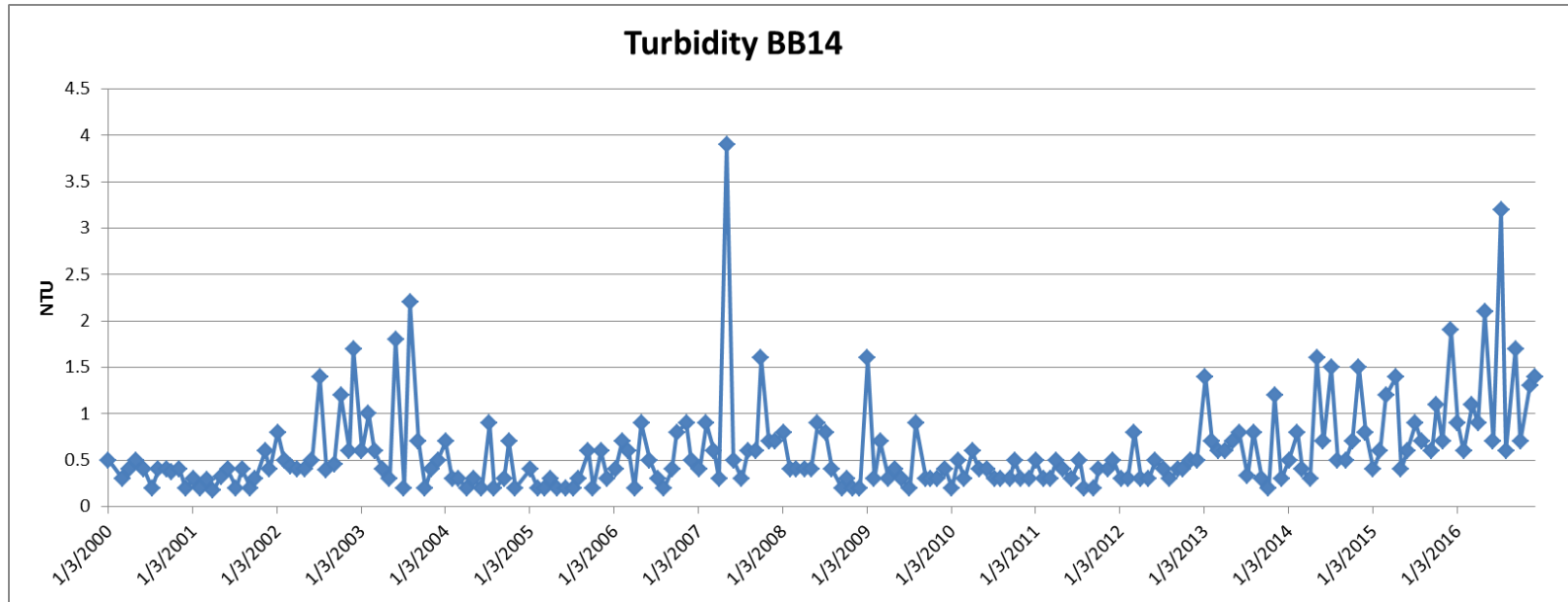


- Dissolved Oxygen:
 - 0.57 reading Jan 2014
 - Elevated values since Nov 2014



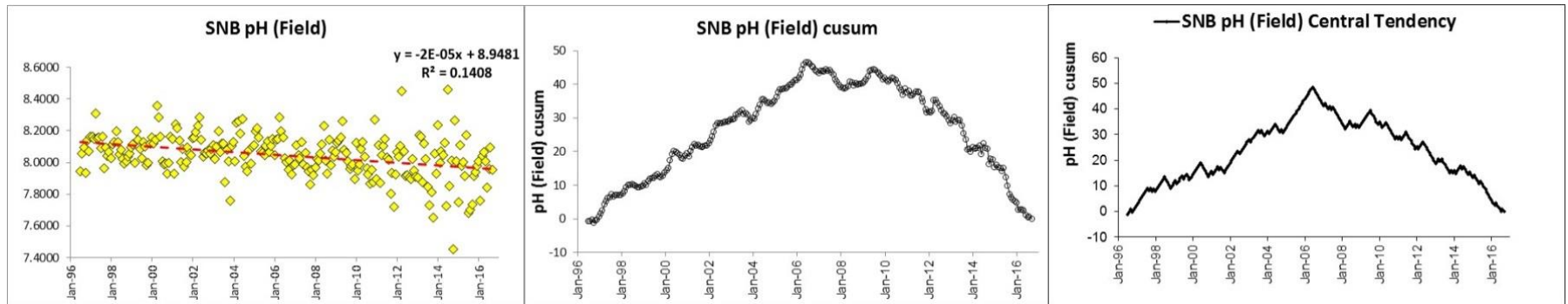
- Temperature:
 - Grab samples, therefore limited interpretation.

Julia Tuttle Basin Turbidity



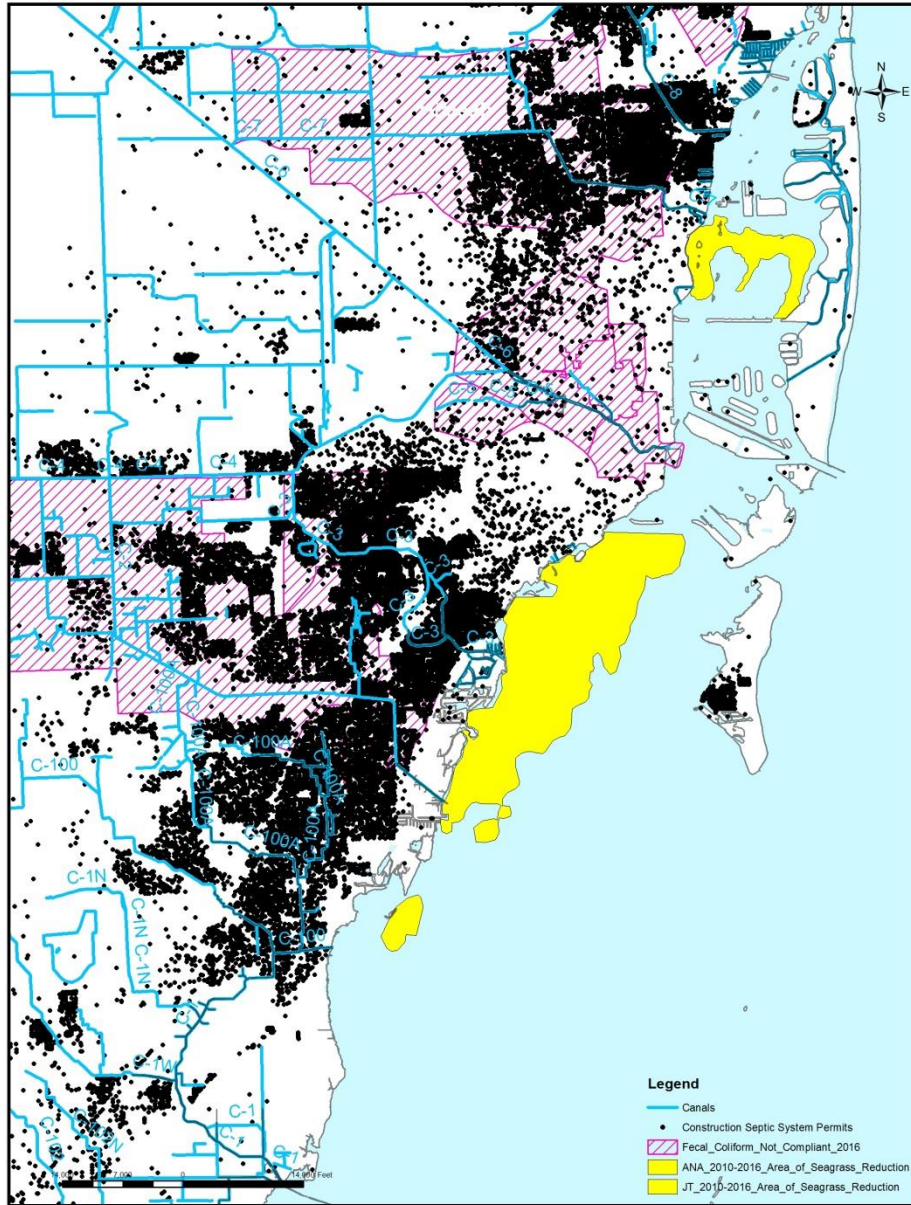
- Following the loss of seagrass the basin now has increased turbidity / sediment resuspension.

Long Term Evaluation of Physical Parameters in the South North Bay Region



- All parameters showed no trends with the exception of pH.
- pH has a declining trend over the 20 year period for nearly all of Biscayne Bay.

Water Bodies Impaired for Fecal Coliform and Septic Systems



Map shows the most recent active septic construction permits, and the Water Bodies identified as impaired for Fecal Coliform in 2016.

- Little River /C-7 Water - 20% of Fecal Coliform samples exceeded 400cfu in the Body for 2016.
 - Frozen seagrass samples available for analysis.
- Coral Gables Waterway / C-3 and Snapper Creek / C-2 also impaired with 20.4% and 15.6% of the F.coli samples exceeding the standard.
- Seagrass community impacted by and *Anodyomene* (macroalgal) bloom and studies found high Nitrogen ratios, heavy isotopic Nitrogen, and sucralose in surface water samples.

Summary

- The basin seagrass community was dominated by high biomass & high density *Syringodium* , and had the highest metrics measured by the DERM monitoring network.
- One low dissolved oxygen measurement of 0.6mg/l was made in the area of die off in Jan 2014 and filamentous algae associated with low oxygen and sulfides were observed in 2016.
 - High biomass / high density seagrass die-off events have been associated low dissolved oxygen and sediment sulfide stress, which have documented by in DERM and other studies in the region, this could be a driving factor in the progression of seagrass loss in this basin.
- The Little River Canal is impaired for F. coli.
 - The area associated with *Anadyomene* sp, and seagrass losses are offshore of canals impaired for F.coli and studies in that area found seagrass and algae with high N ratios, heavy isotopic N in the tissue, and sucrose in a decreasing concentration away from the canals.
- Chlorophyll-A and turbidity have increased following the loss of seagrass. However, associated nutrient measurements have an unclear pattern with regards to the timing of seagrass losses.

Latest Observations and Study Plans Going Forward



- Recent observations indicate the seagrass losses have progressed since 2016 and patches of *Halimeda* are now present.
- Increased spatial sampling planned for this basin and others in the North Bay.
- Frozen *Synrigodium* samples for nutrient content analysis and basin wide monitoring planned for 2017.
- Review existing light penetration data from pre vs. post seagrass loss events and to better quantify the light requirements needed for seagrass recovery.